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Evaluation of the use of a perinatal network platform of Yaoundé, Cameroon: a cross sectional study

Evaluation de l'utilisation de la plateforme du réseau périnatal de Yaoundé, Cameroun : étude observationnelle

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Article original

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ABSTRACT

Background: Neonatal mortality remains high in developing countries due to insufficient or inappropriate perinatal care. Perinatal network platform was developed in 2016 in Cameroon. This network fails to expand, justifying the present study aiming to evaluate the situation.
Methods: We did a cross sectional study in two referral hospital in Yaoundé, Cameroon. We were simultaneously following discussions on the Yaoundé perinatal network plate-form (YPN) and admissions in the referral hospitals to see effectiveness of their use.
Results: We included 172 new-borns of which 17 transferred through YPN, for a rate of use of 10%. Prematurity was the main reason for transfer. Conditions of transport were inadequate in most of the cases, especially in YPN non-users resulting in hypothermia on arrival for 9% of patients. There was no difference between YPN users and non-users regarding duration of transport.
Conclusion: The use of YPN was not optimal. The main reason of referral was prematurity. Conditions of transport were inadequate in most of the cases.

RESUME

Introduction : la mortalité néonatale demeure élevée dans les pays en voie de développement du fait des soins périnataux inadéquats. Le réseau périnatal a été mis en place en 2016 à Yaoundé mais peine à s'étendre. Le but de l'étude était d'évaluer son utilisation actuelle.
Méthodes : Nous avons réalisé une étude observationnelle transversale dans deux hôpitaux de référence de Yaoundé. Nous avons de façon simultanée évaluer les transferts dans ces hôpitaux et suivis les conversations sur la plateforme du réseau de la ville pour évaluer son utilisation.
Résultats : Nous avons inclus 172 nouveaux nés, parmi lesquels 17 ont été transférés après utilisation de la plateforme soit un taux d'utilisation de 10%. La prématurité était le principal motif de transfert. Les conditions de transport étaient inadaptées dans la plupart des cas surtout pour ceux transférés hors réseau. Environ 9% des patients sont arrivés en hypothermie. La durée de transport était quasi-similaire pour les deux groupes.
Conclusion : L'utilisation de la plateforme de périnatalité n'est pas optimale. La principale raison de transfert périnatal est la prématurité et les conditions de transport demeurent inadéquates.

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Introduction

Neonatal mortality remains high in developing countries [1-2]. In Cameroon, it is specifically 10 to 15 times higher than in developed countries [3-5]. The causes of neonatal mortality are multifactorial. Prematurity and low birth weight, neonatal infection, asphyxia and birth trauma are responsible of near 80% of deaths of new born [1-6]. Most of this occurring during the 24 first hours of life. This reflects contribution of conditions of delivery, resuscitation methods, transportation of sick babies [1,3-5]. Thus perinatal care appears to be of great importance to reduce neonatal mortality [1,6-7]. One aspect of perinatal care is perinatal network, developed in 2016 in Cameroon [7-8]. Perinatal network in Cameroon, is based on a social network with aim to identity babies at risk of fetal or neonatal distress for organization of appropriate management [8]. Seven years after initiation, the network seems to still be embryonic with failure to expand to the whole country and integration of new activities. The aim of this study was to evaluate the progress of neonatal transfers by the Yaoundé perinatal network in two referral hospital in this city.

Methodology

We did a cross-sectional study with prospective data collection in Mother and Child Center of the Chantal Biya Foundation and Gynaeco-Obstetric and Paediatric Hospital of Yaoundé. The two hospitals are referral hospitals for neonatal care, and are supposed to received sick neonate from peripheral hospitals. The recruitment period was from March to June 2022. On one hand, our target population was all new-borns transferred in one of the two hospitals. We excluded those whose parents refused to participate in the study. Sampling was consecutive and non-probabilistic.

On the other hand, we followed simultaneously discussions on the Yaoundé perinatal network plate-form (YPN) to see effectiveness of their used for new born transfer. Those using the YPN was named YPN users and the others YPN non-users. We collected data on reasons of transfer, condition of transportation, temperature on arrival. We also noted the presence of a reference sheet and data available on this document. The travel time was calculated from the departure from initial health care structure to arrival in referral hospital. An approximate theoric duration of travel time was calculated using google map, which integrate information on the traffic at the moment of departure.

Data was collected via a questionnaire, inserted in a Microsoft Excel sheet. Analysis was done through SPSS version 23.0. Qualitative data are presented as percentages with confidence interval set at 95% and for a p value less than 5%, and qualitative data are presented as frequencies. The Wilcoxon test served for comparison between group. The work received authorizations from hospital staff, and clearance approval from institutional board of ethics of higher institution of medical technology and biomedical sciences.

Results

We included 172 new-borns from which 92 were males (53.5%). One hundred and ten patients (64%) were admitted in Mother and Child Center. Vaginal delivery was the most frequent one for 74.4 % (n=128) patients. Resuscitation was reported in near 20% (n=34) prior referral. Low birth weight was found in 56% (n=96) patients and prematurity (GA <37 Weeks) in 57% (n=98) ( ).

Table I: *general characteristics of patients*

Item	N (%)
Sex Male/Female	92 (53.5) / 80 (46.5)
YPN users/YPN non users	17 (9.9) / 155 (90.1)
Mode of delivery: Per Vaginal/C section	128 (74.4) / 44 (25.6)
Resuscitation Y/N	34 (19.8) / 138 (80.2)
Low birth weight (<2500g) Y/N	96 (55.8) / 76 (44.2)
Prematurity Y/N	98 (57) / 74 (43)
Site of study: MCC/GOPH	96 (55.8) / 76 (44.2)
Site of delivery	
First level	44 (25.6)
Intermediate level	7 (4)
Basic level	59 (34.3)
Out of health facility	4 (2.3)
Private health facility	58 (33.7)

Yaoundé Perinatal Network (YPN), Mother and Child Center (MCC), Gyneco-Obstetric and Peadiatric Hospital (GOPH), Cesarean section (section), Yes/No (Y/N)

None of health structures, neither peripheral nor referral hospital had Wifi. The use of YPN was found in approximately 10% (n=17) of patients. In 24.5% (n=38) of cases, there was a direct call from periphery to the referral service. In 75.5% (117), there was a direct arrival without information. The site of birth was a private service in 33.7% (n=58), peripheral (basic level) in 34.3% (n=59). When examining discussions found on the social network of the YPN, information found about the patient to transfer was gestational age or age (13/17 patients), weight (12/17) and the

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reason for transfer (17/17). The reasons noted for transfer was need of incubator for 12/17 patients, need of a "paediatrician" for suspicion of neonatal sepsis for 2 patients, oxygen therapy for a patient and in 2 patient's others reasons (congenital malformation).

A reference sheet was available for only 25.6% (n=44), from which 10 of the 17 using the YPN. Information available on the sheet were the name for 72.7% (n=32/44), the age for 81.8 % (n=36/44), the sex for 72.7 % (n=32/44), the weight for 68% (n=30/44), the reason of transfer in 90.9% (n=40/44), the name of the hospital or clinic transferring the patient in 97.7% (n=43/44). This basic information was missing for 3 quarter of the study population (**table II**).

Table II: *information on reference sheet*

Item	YPN Non users (n=34) (%)	YPN Users (n=10) (%)
Name	28 (82.3)	4 (40)
Age or Birth date	26 (76.4)	10 (100)
Sex	24 (70.5)	8 (80)
Weight	20 (58.8)	10 (100)
Reason for transfer	30 (88.2)	10 (100)
Hospital transferring the patient	34 (100)	9 (90)
Destination	20 (58.8)	6 (60)

The main mode of transport for neonates in our study was public transport (taxis) for 58% (n=90), from which 7/17 (41%) using the YPN. An ambulance was used by 6.3% (n=11) families, from which 9 using the YPN, thus 52.9% of those using the YPN and 81.8% of total users of ambulance. Motorbike was used by 5.2 (n=9), none using the YPN (**table III**).

More than three quarters of neonates (79%, n=136) were wrapped and carried by hand during transport, from which 4 out of 17 (23.5%) users of YPN versus 132 (85.1%) of non-users of YPN. Portable incubator was used for 9 babies, representing 52.9% of YPN users. In utero transfer was found in 26 cases (15%), from which 4 users (23.5%) of YPN users. All transferred in utero was addressed to gynaeco-obstetric and paediatric hospital which is also a referral hospital for obstetrical care (table III). Some health care personnel were accompanying the patient in 14% (n=24) cases, from which 9 out of 17 (53%) of YPN users.

Table III: *conditions of patient's transfer*

Item	YPN non users (n=155)	YPN users (n=17)
Mode of transport		
Common taxi	83 (53.5)	7 (41.2)
Ambulance	2 (1.3)	9 (53)
Motorbike	9 (5.8)	0 (0)
Personal car	53 (34.2)	1 (0.3)
By foot	7 (4.5)	0 (0)
Conditions of transport		
Covered by a towel	132 (85.2)	4 (23.5)
Kangoo	1 (0.6)	0 (0)
Incubator	0 (0)	9 (53)
In utero	22 (14.2)	4 (23.5)
Transfer with a health personnel	15 (9.7)	9 (53)
If yes, profile of the HCP (n=24)		
Medical doctor	3 (20)	6 (66.7)
Midwifes	3 (20)	0 (0)
Nurse	9 (60)	3 (34.3)

Yaoundé Perinatal Network (YPN) Health care providers (HCP)

According to our study, 14/155 (13.59%) new-borns transferred outside YPN arrived in hypothermia; on the other hand, there was no hypothermia among new-born YPN users. Duration of transport form departure to arrival to referral hospital varied from 5 to 300 minutes. The mean duration for YPN non-users was 72.8 (+/- 55.68) min (range 5-300) versus 55.06 (+/- 21.05) min (range 30-110) for YPN users. The median theorical travel time, 14.5 min (11.0; 23.50) was significantly shorter than median real time, 60 (38;60) min with a p value of 0.045. We noted a direct non-stop service for YPN users, but some detours were observed for YPN non users.

Thirty patients experienced at least on detour before arrival to referral hospital. Reasons for detour were diverse; there were insufficient technical resources at first referral point in two third of cases (n=21), no place in 7 cases, financial constraints (high cost hospital, n=2) and confusion of referral point in one.

Table IV: *delay between the decision of transfer and effective transfer*

	YPN Non Users (n=155)	YPN Users (n=17)
Within 30 min	19 (11)	0 (0)
30 min-1 hour	45 (29)	4 (23.5)
1>H<2	55 (35.5)	8 (47)
2<H<6 hours	29 (18.7)	2 (11.7)
6<H<24	7 (4.5)	3 (17.6)

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Discussion

Our study was done in only two referral hospitals of the main capital, with a small sample size. However, these data are reliable because, the two others level 1 hospital (Yaoundé Teaching Hospital and Yaoundé General hospital) had the neonatology unit non-functioning during the study period. Thus, this study provides useful information six years after initiation of the YPN.

Within the three months of study duration, we included 172 patients (absolute number 28 patients/month/structure). This is fewer than the 478 patients included during the 2018-2019 evaluation done in Yaoundé. But the latter was done during 13 months among 32 health facilities part of the YPN, this representing approximately 1 patient/month/structure [8]. Another major difference was the analysing perspective [9]. In fact, we recruited in referral hospital to better appreciate those using YPN. The first evaluation analysed inside the YPN, with no idea of what is going on out of the YPN, which is the hidden face of the iceberg. We found that the users of YPN represented only 10% of our sample [8].

Among non YPN users, 38 (22.1%) were transferred after telephone call. This shows that health facilities prefer to call rather than use the WhatsApp* YPN group for neonatal transfers. Many reasons can explain this as the lack of smartphone, not being a member of the Whatsapp YPN group, low internet network, slow response in the group, night time, habit of calling and forgetting the existence of the YPN. In fact, the YPN doesn't includes all health structures of the town, has no permanence service with somebody providing 24 on 24 hours, information on available places. However, further studies are needed to clearly explain why the YPN is not used by health care providers, to properly address that issue.

Reason for transfer was mainly prematurity or need of an incubator for both group. This differ from first evaluation of YPN where the main reason for baby's transfer was the need of oxygen [8]. In fact, after the COVID pandemic, many health facilities were granted with oxygen extractors. This can thus, explain the decrease in need of oxygen as a reason for neonatal transfer. The role of health care providers should be also evaluating, are they more or less able to take care of neonate after initiation of YPN? This is another unanswered question interesting to address. Our results are comparable to those of others African authors [10-11], and of Singh et al in 2021in India, where prematurity was the first reason for transfer [12].

Data were lacking for many patients. A reference sheet was missing in three quarter of the cases for YPN non-users compared to nearly 40% of YPN users. This revealed insufficient knowledge or bad attitudes and practices among health providers delivering care in delivery rooms. This is highlighted by conditions of transport of new-borns in our study. In fact, a taxi, 58% (public transport in Cameroon), was the main means of transportation especially for YPN non-users, the neonate wrapped and transferred without been accompanied by a health professional (79%). Singh et al. in India, found 13,7% use of private ambulances [12], Faye *et al*, in Senegal had 45.4% using taxi, and 30.7% using ambulances [10]. Ambulances are not yet routinely used in developing countries. In absence of universal health coverage, families have to pay this service which is more expensive than public transportation. However, conditions of transport were better for users of YPN, with 53% using ambulance versus 41% using a taxi. The 2017 evaluation of the YPN revealed that taxi was mainly used [8]. This might show a slight improvement but this results is to take with caution as the number of YPN users was very low. Even though ambulances are considered the best way of transportation especially if incubator available inside, the cost is still high and remains unaffordable for many. In this context, kangaroo method is an effective and cost effective alternative [6,13].

Surprisingly, only one (0.58%) premature neonate was transported in kangaroo position, which is an effective way to avoid hypothermia in the neonate. Unfortunately, this method was less use in this study population, completely absent for YPN users. Thus, training of health care providers (HP) of peripheral health structures on kangaroo method is crucial. Another safe transportation method which is in utero, remain low. This can be explained by the fact that, one of the two referral hospital, the Mother and Child Centre has no integrated delivery room. However, this safest method is also less used and reasons has to be clearly identified to be properly addressed.

From departure to arrival in the referral service, neonate spent around 55 - 60 min for both users and non-users YPN. This duration is similar to Faye et al. who found a duration less than an hour [8]. Theorical duration on google map was shorter 14 min. Thus 40 min can be attributed to non-medical reasons like the roads, traffic especially in YPN users group, as most of them used ambulances and some private cars. In YPN non-user's groups, most of the neonate did at least one stop before arrival to the referral center even

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though the difference of transportation duration was not significant. This is the key point address by the YPN. To reduce this duration in both group, a multi sectorial approach is needed.

Hypothermia was found on arrival in 9% of YPN non-users due to inappropriate conditions in transport [14]. This is lower than that of Dicko Traoré et al. in 2010, 99.86%; Njom Nlend et al. in 2016 [3], 61.64%; Faye *et al*. 2016, 33.8%, Singh et al in 2021, with 32.5% [6-10]. This decrease in time show a slight improvement. No hypothermia was found in YPN users.

Conclusion

Only 1 newborn on 10, in our study was transferred via the YPN. The main reason of referral was prematurity. Conditions of transport were inadequate in most of the cases, especially in YPN non-users resulting in hypothermia on arrival for 9% of patients. Mean duration of transportation was similar in both YPN users and non-users. Senzitisation and training of targetted health care providers should improve use of the plateform.

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All authors contributed to all the different steps of the study
Study design: Sap S, Njimbon DV, Koki P, **Litterature review:** Sap S, Njimbon DV, Epée J, Vougmo C, Stat analysis: Sap S, Njimbon DV, Epée J, Drafting: Sap S, Njimbon DV, Bugin J, Epée J, **Reviewing**: Sap S, Njimbon DV, Epée J, Vougmo C, Koki P.

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